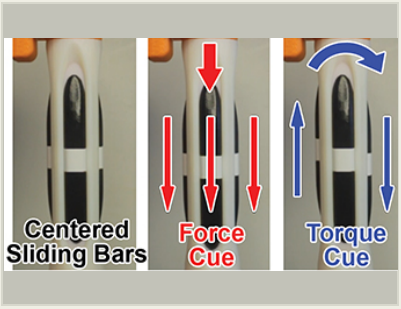
Natural Touch Interaction for Virtual Reality and Teleoperation via Ungrounded Tactile Shear Feedback, Phase I

Completed Technology Project (2014 - 2014)

Project Introduction

The proposed research innovation will create a low-cost, intuitive means for people to have multi-fingered interaction with Robonaut 2 and training simulations via tactile shear feedback. This work builds on the PI's prior university research. Tactile shear feedback imparts friction and shear forces to the user's hand via sliding plates that are built into the handle of the grasped device. These sliding plates rub against the user's skin and induce in-hand friction forces to create perceived force/torque-like sensations despite not being connected to a fixed surface. Translational motions and forces can be portrayed along the length of the handle by moving the sliding plates in unison in the corresponding direction; whereas moving the plates at opposing locations in the handle in opposite directions creates the feeling of the device's handle wrenching within the user's grasp. To this novel form of haptic feedback, the PI proposes to add a more intuitive means for a user to interact with virtual and teleoperated environments by allowing the user to open and close his/her grasp as he/she would naturally do when grasping an object. It is hypothesized that adding the ability for the user to interact by opening and closing his/her grasp will provide improved interaction performance and be preferred by users. The proposed work also creates the ability to individually control the fingers on multi-fingered robot hands like those on Robonaut 2. Our developed haptic interface will provide a low-cost means for mission scientists, astronauts, and others to interact with Robonaut 2. The developed interface will also provide greater access for planning and training of EVAs, and could provide a more intuitive interface for ground personnel to operate and supervise robots. Furthermore, the developed system's low cost would also permit it to be used directly in NASA outreach / STEM (Science, Technology, Engineering, & Math) activities.



Natural Touch Interaction for Virtual Reality and Teleoperation via Ungrounded Tactile Shear Feedback Project Image

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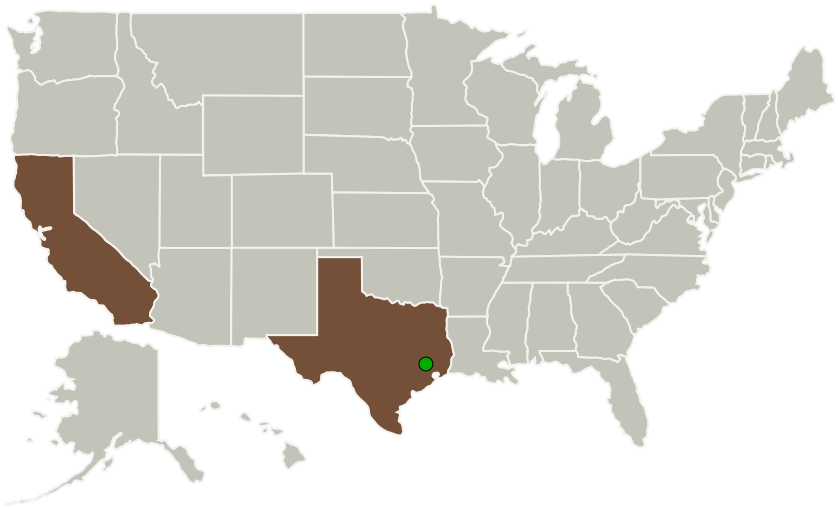
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Tactical Haptics	Lead Organization	Industry	Fremont, California
Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations	
California	Texas

Project Transitions

June 2014: Project Start

December 2014: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/137428)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Tactical Haptics

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

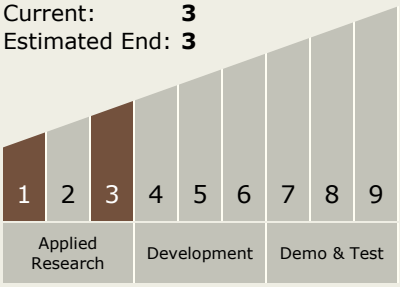
Carlos Torrez

Principal Investigator:

William Provancher

Technology Maturity (TRL)

Start: **1**
Current: **3**
Estimated End: **3**



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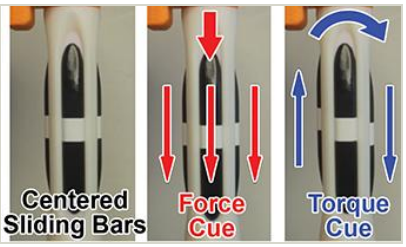
Images



Project Image
Natural Touch Interaction for Virtual Reality and Teleoperation via Ungrounded Tactile Shear Feedback Project Image
(https://techport.nasa.gov/image/129929)

Technology Areas

Primary:

- TX04 Robotic Systems
  - TX04.3 Manipulation
    - TX04.3.2 Grappling Technologies

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System